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Kuby Immunology

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Fourth Edition

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Carrying forward the tradition of fine teaching and scientific excellence established by the late Janis Kuby in the first three editions of *Immunology*, the new author team of the *Fourth Edition*maintain a student-friendly approach to the subject while offering cutting-edge coverage of new discoveries and concepts in this rapidly evolving field. The ever-increasing impact of immunology on modern medical practice is reflected, with enhanced emphasis on clinical aspects of immunology. As always, the text employs a range of effective pedagogical tools not found in other introductory books on the subject.

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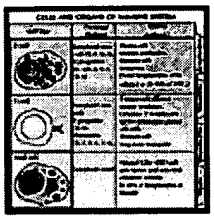
Chapter 2 Animations

Animations of various complex text concepts and figures will provide a better understanding of immunological processes. The animations also provide expanded explanatory descriptions of the illustrated text concepts.

NOTE: For optimal performance, please be sure to wait until the animation is completely downloaded before attempting to run it.

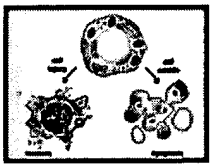
"i-buttons" appear throughout the animations. Clicking on this icon will provide addition information on the given subject.



Cells and Organs of the Immune System

See pages 35-57 and the accompanying figures.

The immune system is found throughout the body and is made up of many different cells, organs, and tissues. The organs and tissues of the system can be classified into two main groups: (1) primary lymphoid organs, in which lymphocytes are generated and undergo development and maturation, and (2) secondary lymphoid organs and tissues, where mature lymphocytes interact with antigen. The vessels of the blood and lymphatic systems connect lymphoid organs and tissues and unite them into a functional whole. Leukocytes, or white blood cells, are found within the blood, lymph, and lymphoid tissues and organs. The vertebrate immune system contains many types of leukocytes, but only the lymphocytes have the attributes of receptor diversity, antigen specificity, and self/nonself recognition that are the hallmarks of adaptive immunity. This interactive gallery of cells, tissues, and organs is a guide to the essential elements of the immune system. It also shows the anatomical sites of major organs and tissues of the immune system within the body.

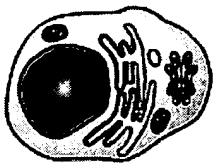
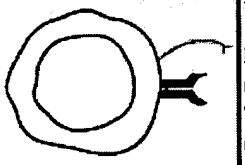
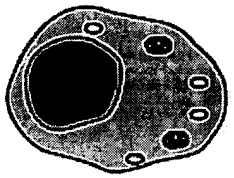


Cell Death

See pages 31-33, 260-263, and 354-360, and Figures 2-3, 10-19, 10-20, 14-4, and 14-9.

Programmed cell death is an induced and orderly process in which the cell actively participates in its own demise. The morphological process resulting in programmed cell death is called apoptosis. Apoptosis is easily distinguished from necrosis (cell death from external injury) by a number of morphological criteria presented in this animation. From the viewpoint of the immune system, an important feature of apoptotic death is the engulfment of the dead cell by surrounding phagocytic cells, because this prevents an inflammatory response. There are many instances in which apoptosis is used to remove unwanted lymphocytes. For example, several days after their stimulation, activated peripheral T cells are induced to die via apoptosis, thus ensuring the removal of a highly proliferative cell population that is secreting inflammatory cytokines. In addition, CTLs kill target cells by inducing apoptosis in the target population. Defects in apoptosis may lead to disease, as highlighted in the Clinical Focus essay on pages 262-263.

CELLS AND ORGANS OF IMMUNE SYSTEM

Cell Type	Precursor (factors)	Activity (cells/μL)	
B cell 	Lymphoid stem cell (IL-7, IL-3); B progenitor (IL-4,IL-2, IL-5, IL-6).	Plasma cell: secretes antibodies. Memory cell: immunity. (Total lymphocytes: 2750 cells/μL or 20-40% of WBC.)	Lymphocytes
T cell 	Lymphoid stem cell; B progenitor (IL-4); Thymocyte (IL-7, IL-2, IL-4).	T helper cell (CD4+): secrete cytokines. Cytotoxic T lymphocyte (CD8+):Eliminate altered self-cells. Memory cell: long-term immunity.	Monocytes
Null cell 	Lymphoid stem?	Natural Killer (NK) cell: anti-tumor and anti-viral cytotoxic activity. (5-10% of lymphocytes in blood.)	Granulocytes
			Organs

Web Links

- National Cancer Institute and National Institute of Allergy and Infections Diseases: Understanding the Immune System
- Cell Biology Laboratory Manual
- Loyola University, Chicago, Histology
- University of Kansas, Blood and Bone Marrow
- Fun Science Gallery, Blood cells

Further Reading

1. Cells and Organs of the Immune System (Chapter 2) R. A. Goldsby, T. J. Kindt and B. A. Osborne. *Kuby Immunology,*4th edition, W. H. Freeman and Co., pp. 27-59, 2000.
2. B. Purves, G. Orians, C. Heller and D. Sadava. *Life - The Science of Biology*, 5th edition, Sinauer and W. H. Freeman and Co., pp. 400-427, 540-546, and 1031, 1998.

Acknowledgements

- Virginia Scofield, University of Southern California, Los Angeles, CA.